

REMARKS

Claims 2, 12, 22 and 42 have been canceled. Claims 1, 11, 21, 31, 41, and 51 have been amended. Therefore, claims 1, 3-11, 13-21, 23-41, and 43-60 are pending in the present application.

The Examiner rejected Claims 1-30 and 41-60 under 35 U.S.C. § 112, second paragraph, as being indefinite. In light of the amendments made to claims 1, 11, 21, 41, and 51, and the cancellation of claims 2, 12, 22 and 42, in order to address the Examiner's concerns, Applicants respectfully traverse this rejection. As a result of the cancellation and amendments provided above, Applicants respectfully assert that the rejection under 35 U.S.C. § 112 is now moot and that claims 1, 3-11, 13-21, 23-41, and 43-60 are allowable.

The Examiner rejected claims 1, 2, 5, 6, 9-12, 15, 16, 19-22, 25, 26, 29-32, 35, 36, 39-42, 45, 46, 49-52, 55, 56, 59, and 60 under 35 U.S.C. § 102(b) as being clearly anticipated by U.S. Patent No. 4,166,783 (*Turner*). In light of the amendments and arguments provided herein, Applicants respectfully traverse this rejection.

In the Office Action dated June 12, 2003, the Examiner indicated that "*Turner* does not use deposition rate sensors to determine the deposition rate...", see page 2 of the Office Action dated June 12, 2003. Claim 1 (as amended) of the present invention calls for modeling the deposition rate using sensor data, which is not disclosed, taught, or suggested by *Turner*.

Furthermore, *Turner* does not disclose other elements called for by claim 1 of the present invention. *Turner* discloses a sputtering system in which the desired deposition rate information

is inputted by an operator to calculate the required power (see col. 3, lines 30-34). In contrast to claim 1 of the present invention, *Turner* discloses that deposition rate sensors are not used to complete a feedback loop, but uses the sputtering source itself. *Turner* discloses using the sputtering to allow for regulation and correction of a process (col. 3, lines 64-67). However, *Turner* does not disclose monitoring the consumption of a sputter target to determine a deposition rate, as called for by claim 1 of the present invention. *Turner* discloses using the power and duration of the sputtering source operation and calculating a percentage of normalized deposition rate.

Additionally, claim 1 (as amended) of the present invention calls for modeling the dependence of the deposition rate on plasma power or the deposition time based upon the target life of the sputter target. This is in contrast with *Turner* since it does not disclose modeling the deposition rate at all. Figure 1 merely plots a relationship between a percentage of normalized deposition rate and kilowatt-hours of operation of the cathode (see Figure 1 and col. 2, lines 35-44). This is provided to illustrate the deterioration of the deposition rate. However, this is not equivalent to modeling the dependence of the deposition on plasma power or the deposition time based upon the target life of the sputter target, since *Turner* merely demonstrates the deterioration of the deposition rate after a certain amount of kilowatt-hours.

Furthermore, the Examiner equates aging of the cathode in use to “target lives,” however, the “target lives” refer to the lives of the sputter targets (see col. 2, lines 10-13). Therefore, *Turner* does not call for modeling any parameters based upon target lives. Additionally, the Examiner states that the graph in Figure 1 plotting the percentage of normalized deposition rate versus the cathode operation (kilowatt-hours) can be used to imply a modeling of deposition rate

to plasma power. However, the Examiner offers neither arguments nor evidence to support such a conclusion, nor is there any evidence in *Turner* to support such an assertion. Therefore, *Turner* does not disclose the element of modeling the dependence of the deposition on plasma power or the deposition time based upon the target life of the sputter target, or using the model to modify a deposition process, as called for by claim 1 (as amended) of the present invention.

Turner discloses using the desired rate specified by the operator, and using an equation in a loop to correct the power for the usage of a cathode used in the sputtering system (see col. 3, lines 32-38, and the equation on col. 3, line 27). *Turner* discloses that the duration of the cathode usage is then incremented, updating the kilowatt hours of use (see col. 3, lines 38-42). *Turner* corrects the current control of the cathode power supply and continues the loop for controlling the processing of a semiconductor wafer (see col. 3, lines 46-49). In contrast to *Turner*, claim 1 calls for modeling the dependence of the deposition rate on the plasma power or deposition time based upon the target life, and using the model to modify the deposition processing to approach a desired thickness. Therefore, claim 1 (as amended) is not taught, disclosed, or suggest by *Turner*. Hence, claim 1 is allowable. Additionally, independent claims 11, 21, 31, 41, and 51, (all as amended), which have similar elements that call for modeling the dependence of the deposition rate on the plasma power or deposition time based upon the target life, and using the model to modify the deposition processing to approach a desired thickness, are also allowable for at least the reasons cited above. Therefore, in light of at least the above-presented arguments, claims 11, 21, 31, 41, and 51 are also allowable.

Independent claims 1, 11, 21, 31, 41, and 51 are allowable for at least the reasons stated above. Dependent claims 2, 5, 6, 9, 10, which depend from independent claim 1; claims 12, 15,

16, 19, 20, which depend from independent claim 11; claims 22, 25, 26, 29, 30, which depend from independent claim 21; claims 32, 35, 36, 39, 40, which depend from independent claim 31; claims 42, 45, 46, 49, 50, which depend from claim 41; claims 52, 55, 56, 59, and 60, which depend from independent claim 51, are also now considered to be patentable in light of at least the above-presented arguments.

The Examiner rejected claims 3, 4, 7, 8, 13, 14, 17, 18, 23, 24, 27, 28, 33, 34, 37, 38, 43, 44, 47, 48, 53, 54, 57, and 58 under 35 U.S.C. § 103(a) as being unpatentable over *Turner* in view of U.S. Patent No. 6,217,720 (*Sullivan*).

The Examiner stated that the elements relating to the dependence of the deposition rate on the deposition time or inverting the deposition rate model to determine the deposition time is not disclosed by *Turner* and uses *Sullivan* to provide such elements. However, as described above, *Turner* does not disclose methods and/or apparatus for modeling the dependence of the deposition rate on the plasma power or deposition time based upon the target life using deposition sensor rate data, and using the model to modify the deposition processing to approach a desired thickness, which are called for by claims 3, 4, 7, 8, 13, 14, 17, 18, 23, 24, 27, 28, 33, 34, 37, 38, 43, 44, 47, 48, 53, 54, 57, 58 by virtue of their respective dependencies. Therefore, adding the disclosure from *Sullivan* would not make-up the deficit of *Turner*.

Sullivan discloses a multi-layer sputtering method in which a controller calculates a sputtering time required for the deposition of a specified layer thickness (see col. 7, lines 54-57). *Sullivan* discloses a theoretical model that models deposited layer. However, *Sullivan* does not disclose modeling the dependence of deposition rate to deposition time. *Sullivan* adjusts the layer thickness in the theoretical model (see col. 7, lines 65-67). The Examiner states that the

fact that determining a deposition time requires a certain deposition rate equates to modeling a dependence of deposition rate on the deposition time. Applicants respectfully disagree. No evidence or arguments that would support such a conclusion is provided. *Sullivan* is directed towards calculating sputtering time for deposition of specified layer thickness, deposition rates are not calculated in this context. Additionally, *Sullivan* does not disclose inverting the deposition rate model to determine the deposition time to reach a deposition rate. Therefore, for at least the reasons cited above, adding the disclosure of *Sullivan* to the disclosure of *Turner*, would not provide all of the elements of claims 3, 4, 7, 8, 13, 14, 17, 18, 23, 24, 27, 28, 33, 34, 37, 38, 43, 44, 47, 48, 53, 54, 57, 58. Therefore, in light of at least the above presented arguments, claims 3, 4, 7, 8, 13, 14, 17, 18, 23, 24, 27, 28, 33, 34, 37, 38, 43, 44, 47, 48, 53, 54, 57, 58 are allowable.

The Examiner rejected claims 9, 10, 19, 20, 29, 30, 39, 40, 49, 50, 59, and 60 are additionally rejected under 35 U.S.C. § 103(a) as being unpatentable over *Turner* as applied to claims 1, 2, 11, 12, 21, 22, 31, 32, 41, 42, 51, and 52 above, and further in view of Official Notice.

As described above, *Turner* does not disclose methods and/or apparatus for modeling the dependence of the deposition rate on the plasma power or deposition time based upon the target life using deposition sensor rate data, and using the model to modify the deposition processing to approach a desired thickness, which are called for by claims 9, 10, 19, 20, 29, 30, 39, 40, 49, 50, 59, and 60. The Examiner uses Official Notice to provide the element of modeling deposition rate and power using curve-fitting techniques. However, Applicants respectfully assert that the Examiner does not provide any evidence to support such an assertion. Furthermore, even if,

arguendo, the element of modeling deposition rate and power using curve-fitting techniques were added to the disclosure of *Turner*, the deficit of *Turner* would not be compensated since *Turner* does not disclose modeling the dependence of the deposition rate on the plasma power or deposition time based upon the target life using deposition sensor rate data, and using the model to modify the deposition processing to approach a desired thickness, which are called for by claims 9, 10, 19, 20, 29, 30, 39, 40, 49, 50, 59, and 60. Therefore, claims modeling the dependence of the deposition rate on the plasma power or deposition time based upon the target life using deposition sensor rate data, and using the model to modify the deposition processing to approach a desired thickness, which are called for by claims 9, 10, 19, 20, 29, 30, 39, 40, 49, 50, 59, and 60 are allowable for at least the reasons cited above.

Reconsideration of the present application is respectfully requested.

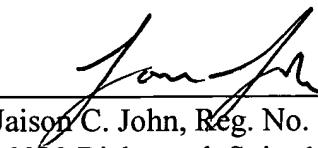
In light of the arguments presented above, Applicants respectfully assert that claims 1, 3-11, 13-21, 23-41, and 43-60 are allowable. In light of the arguments presented above, a Notice of Allowance is respectfully solicited.

If for any reason the Examiner finds the application other than in condition for allowance, **the Examiner is requested to call the undersigned attorney** at the Houston, Texas telephone number (713) 934-4069 to discuss the steps necessary for placing the application in condition for allowance.

Respectfully submitted,

WILLIAMS, MORGAN & AMERSON, P.C.
CUSTOMER NO. 23720

Date: August 25, 2003

By: 

Jaison C. John, Reg. No. 50,737
10333 Richmond, Suite 1100
Houston, Texas 77042
(713) 934-7000
(713) 934-7011 (facsimile)
ATTORNEY FOR APPLICANT(S)